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F. J. Sidney, LL. D., then moved, and J. F. Waller, LL. D., seconded, the following amendment:—That such articles as it may be thought by the Council desirable to lend be forwarded for exhibition in the Museum, South Kensington, London, belonging to the Science and Art Department of the Committee of Council on Education, during the forthcoming International Exhibition of 1862.

A division having taken place, it appeared that there were 24 votes for, and but 7 against, the amendment, which was accordingly declared by the President to be carried.

The Lord Chief Baron then moved, and the Rev. Professor Jellett seconded, as an addition to the amendment:—That, in executing the amendment which has been now passed, the Council have due regard to the safety of the articles selected for transmission to London, and the means to be adopted for their transmission, and for their secure custody there. This motion, having been put by the President, was adopted.

MONDAY, APRIL 28, 1862.

The Very Rev. Charles Graves, D. D., President, in the Chair.

Mr. F. J. Foot read a paper "On the Botanical Peculiarities of the Burren District, county of Clare."

The Rev. H. Lloyd, D. D., D. C. L., read the following paper:—

On Earth-currents in connexion with Magnetic Disturbances.

In a paper recently communicated to the Academy, the author showed that the regular diurnal changes of the horizontal component of the earth's magnetic force are due to electric currents traversing the earth's crust, these currents operating as disturbing forces, which cause the magnets to deviate from their mean positions according to known laws. This relation being once established, the diurnal laws of the Earth-currents may be inferred from their effects. It was thus ascertained that the azimuth and the intensity of the currents varied throughout the day, according to certain laws depending upon the hour-angle of the sun. At different parts of the globe these laws were found to exhibit certain well-marked features in common; while their differences were accounted for, in many instances, by the geographical and physical characters of the region in which they occur. The author now proceeds to extend the same inquiry to the currents which produce the *magnetic disturbances.*

It has been shown, by the labours of Kreil, Sabine, and others, that the disturbances of the magnetic elements are subject to periodical laws, depending upon the hour, which are constant for a given place, and for a given season of the year. The sums of the changes produced by these disturbances, at each hour of observation, have been calculated by General Sabine for three of the British Colonial Observatories. The corresponding quantities have been deduced by Dr. Lamont, for Munich; by Mr. Broun, for Makerstoun, in Scotland; and by the author, for Dublin.

We possess, in addition to the foregoing, similar results at Lake Athabasca, in British North America, deduced by Colonel Lefroy from observations made by himself, and which, although derived from a shorter series of observations, are of the highest scientific value. For these places, therefore, it only remains to combine the results of the declination and horizontal intensity, by the method which has been already applied to the regular changes of the same elements.

The result of this calculation, applied to the Dublin observations, shows that the direction of the *disturbance-current* at that place observes a mean law, not very dissimilar to that which governs the regular diurnal current. Its azimuth rotates, during the day, in the same direction as the sun, its direction pointing almost exactly to the luminary. The direction is *east* about 5 A. M.; *south*, about noon; and *west*, at 6 P. M. The current is *easterly* from 9 P. M. to 9 A. M., inclusive, and *westerly* during the remainder of the 24 hours. The mean azimuth of the easterly current, measured from the north eastward, is 40° 15′; that of the westerly is 230° 18′. If the mean directions of the easterly and westerly currents be assumed to be in the same right line, the mean azimuths will be N. 45° E., and S. 45° W. This result agrees, in a very remarkable manner, with those obtained by Mr. Barlow and Mr. Walker from the direct measures of the intensity of the Earth-currents, as observed on days of disturbance in several of the telegraphic lines of England; and the agreement must be regarded as an additional proof of the dependence of the magnetic changes upon Earth-currents.

The phenomena at Makerstoun are very similar to those at Dublin; and the epochs of the passage of the current through the cardinal points are nearly the same.

At Toronto, in Canada, the current is *wholly easterly*, the mean azimuth being 81° 25′. On the other hand, at Athabasca, the current is *easterly* from 12 P. M. to 6 A. M., inclusive, and *westerly* during the remainder of the 24 hours; the sums of the easterly and westerly changes for the entire day balance one another, the easterly currents being as much greater in magnitude as they are less in duration. The mean azimuths are 110° 18′ and 290° 56′.

At St. Helena the direction of the current is *easterly* throughout the day, the mean azimuth being 70° 53′. The direction is singularly constant, the greatest deviation from the mean being only 10°. The phenomena at the Cape of Good Hope closely resemble those at St. Helena, The direction of the current is *easterly* at every hour, excepting 5 A. M.. when there is a slight westerly movement. The mean azimuth is 77° 54′.

It thus appears that at some places—as in the British Islands—the mean direction of the disturbance current *rotates* through the entire compass in the course of the day; while at others—as Munich, Toronto, St. Helena, and the Cape of Good Hope—it is *easterly throughout the day.* While, therefore, there is a periodicity in the easterly and westerly currents depending on the hour, we are obliged to infer that there is, at the same time, some cause *constantly* operating which tends to produce an *easterly current.*

The *mean azimuth* of this current appears to be connected with the *magnetic meridian* of the place, to which it is nearly perpendicular. This will appear from the following Table of the mean azimuths of the disturbance-currents at the northern stations, measured from the astronomical and from the magnetical meridians, respectively:—

Places.	Az. (Astron.)	Az. (Magn.)
Dublin, ...	45°	72°
Makerstoun, . . .	51	76
Munich, ...	52·5	69
Toronto, ...	81·5	83
Athabasca, ...	110	81

The mean azimuth (magnetic) for the five stations is E. 14° N. The mean azimuth of the two stations in the Southern hemisphere is E. 11° S., deviating nearly as much to the *south*, as that of the northern stations deviates in the opposite direction. It thus appears that while the principal current is *eastward* in both hemispheres, there is also a *meridional* current tending northward in the Northern hemisphere, and southward in the Southern. Its intensity is between one-fourth and one-fifth of that of the other component.

These results are wholly at variance with the hypothesis imagined by M. de la Rive in explanation of the phenomena of magnetic disturbances, according to which the disturbance-current flows from north to south only.*

The diurnal changes of the *intensity* of the disturbance-currents present features equally marked. In order to perceive them clearly, it may be convenient to examine separately the meridional currents, and those at right angles to the magnetic meridian.

The meridional currents are developed chiefly at the European stations, and at Toronto, in Canada: at Athabasca, and at the southern stations, they are comparatively small. The *northerly* maximum occurs at Toronto at 9 P. M., at Munich at 10 P. M., and at Dublin at 11 P.M. Its epoch at Makerstoun is between 9 P. M. and 11 P. M. The *southerly* maximum occurs at 8 A. M., very nearly, at the four stations. Thus the epochs are nearly at the *same hours of local time,* notwithstanding the differences of longitude.

A similar result appears from an examination of the currents at right angles to the magnetic meridian. Thus, in the northern hemisphere, the *easterly* maximum occurs between 2 A. M. and 4 A. M., and the *westerly* maximum (or easterly minimum) between 3 P. M. and 5 P. M. The two epochs are precisely the same at Makerstoun and at Toronto, places which differ more than five hours in longitude.

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* The discrepancy of M. de la Rive's hypothesis with the phenomena of the Earth-currents, as observed in the British Islands, has been already pointed out by Mr. Walker. It is even more marked at other parts of the globe.

The corresponding epochs for the two stations in the southern hemisphere in like manner agree with one another. The *easterly maximum* occurs between 6 P. M. and 7 P. M. at St. Helena and the Cape of Good Hope, and the easterly *minimum* between 5 A. M. and 6 A. M. It is deserving of remark that these epochs do not differ considerably from those of the *opposite* movements in the northern hemisphere, the *easterly* extreme in the one corresponding nearly with the *westerly* extreme in the other. A similar opposition in the phenomena of the *regular* diurnal change in the two hemispheres was pointed out by the author on a former occasion, and there seems good reason to suppose that the two facts are physically related.

It appears, then, that the principal epochs of the disturbance-currents depend, in their mean values, upon the sun's hour-angle, and are independent of the longitude of the place at which they occur.

The foregoing relations, in the phenomena of the disturbance-currents, or in those of their effects, appear to be of a very general nature, and such as to afford a distinct basis for physical theory. The author hoped to resume the subject upon a future occasion.

MONDAY, MAY 12, 1862.

The VERY REV. CHARLES GRAVES, D. D., President, in the Chair.

RESOLVED, on the recommendation of the Council,—That the sum of £50 be placed at the disposal of the Council for the purchase of antiquities, and for the arrangement of the Museum.

Captain Meadows Taylor, by permission of the Academy, read a paper "On the Cromlechs and other Antiquarian Remains in the Deccan."

The SECRETARY of the Academy read the following paper by Lieutenant J. HAUGHTON, R. A.:—

ON THE DIFFERENCE BETWEEN RAIN-FALL AND EVAPORATION AT ST. HELENA IN 1860.

THE following observations were made, at the request of the Rev. Professor Haughton, in the island of St. Helena, under the following conditions:—

The *evaporation gauge* consisted of a cylindrical glass vessel, 9 inches high, and 4·85 inches wide. The level of the water was read off, and brought to the zero (at the middle of the vessel) every Sunday morning, at 10.45 A. M. The gauge was placed on the exposed roof of a house, 15 feet high, and was open on all sides to rain, wind, and sun. It was at the leeward side of the island, the wind blowing almost always S. E. The gauge was exactly 700 feet above the sea-level.

In the year (of fifty-two weeks) commencing 12th February, 1860, and ending 10th February, 1861, the total excess of evaporation over rain-fall was 81·42 inches; and in no single week did the rain-fall exceed the evaporation.